Laureates Come Down to Earth...

... to Lake Constance, in effect, where at the end of June the island town of Lindau welcomed the 44th annual reunion of Nobel laureates. It was the fifteenth time the physicists met, who in successive years take it in turn with the laureates in chemistry and medicine. When, in 1951, Count Bernadotte initiated these events the intention was to help those engaged in German and central European academic life and isolated through war, regain contacts with the international scientific community. The Nobel laureates, nucleus of eminent scientists, served as a powerful catalyst in this process. Over the years more and more interest has concentrated on the younger generations at the start of their academic or industrial careers.

They were offered a unique opportunity of meeting and talking to leaders in their field, real people who otherwise may have remained just textbook references to them. This year's record attendance of almost 600 students and assistants from German institutions was boosted by a large contingent of foreign and grant-aided participants from 47 countries all around the globe. Eager for advice they had many occasions, even during the final boat trip to the flower paradise, Mainau island, of individual chats with the laureates. These, in turn, benefited from being confronted at first hand with the problems faced by those about to enter the world of science.

Much needed backing for the annual meetings is provided by local authorities, commerce and industry, and, increasingly, by international institutions, such as the European Union, the European Science Foundation and the Nobel Foundation, who have recognized the lasting value of these valuable encounters.

Ranks of renown: after a lakeside lunch a score or so of Nobel laureates, mostly physicists, listen to a humorous address by one of their number, a tradition at their Lindau reunions. This year's speaker was Ivar Giaever, standing next to Countess Bernadotte who heads the organization of these annual meetings. (Courtesy: Photo-Studio Jacobs, Lindau)

What with students, professors, active scientists, diplomats, and media representatives, a capacity audience of about 800 enjoyed a great variety of lectures given by the laureates. On a theoretical level, T.D. Lee (Nobel Prize 1957) affirmed that composite elementary particles may sometimes be treated as elementary particles in their own right. Willis Lamb (1955) attending for the thirteenth time, speculated on advantages that might have resulted from an earlier and better understanding of quantum mechanics if Newton had discovered the Schrödinger equation in 1660.

Subrahmanyan Chandrasekhar (1983) linked Newton with Michelangelo in considering human creativity in science and art. Both men were most reluctant to embark on their projects, the *Principia* and the Sistine Chapel frescoes, but once persuaded or even coerced they worked with increasing enthusiasm and completed their tasks in record time. Murray Fell-Mann (1969) examined complexity and complex adaptive systems, highly relevant now when chaos is a respectable object of study. In the 1960s, he had proposed the quark model, then a mere figment of theory, and here were J.I. Friedman and R.E. Taylor (1990, with H.W. Kendall), who in the 1970s had proved its physical reality through electron-positron inelastic scattering, reporting on the latest experiments. Another "impossibility" of recent times, the manipulation of single electrons in semiconductors, was shown to be feasible by Klaus von Klitzing (1985). How much smaller than single-electron devices can one get?

According to Norman Ramsey (1989) the measurement of effects predicted by special and general relativity, once considered improbable, could be carried out thanks to improvements in the accuracy and stability of atomic clocks. The science of nonlinear optics, long pre-dating Einstein, only really came into its own with the recent advent of powerful laser light sources and, as Nicolaas Bloembergen (1981) pointed out, its field of applications is wide.

As for the large machines, Melvin Schwartz (1988) reported that the veteran Brookhaven synchrotron (AGS), now much rejuvenated, can produce beam intensities a thousand times higher than when commissioned over 30 years ago, and Broohaven's new relativistic heavy-ion collider RHIC should provide measurement accuracies never achieved before. How and what to measure was the main concern of Rudolf Mössbauer (1961) who in numerous experiments over many years has tried to interact with the elusive neutrinos to determine their properties. Awaiting the results of his latest searches, he seemed less optimistic than on previous occasion; our present means may prove to be inadequate for finding the missing parameters or solving the mystery of solar neutrino shortcomings. Samuel Ting (1976), an early protagonist of earth-bound experiments involving large-scale collaborations, now turns his attention to outer space where a search for antimatter could be carried out with rather expensive equipment, but needing a much smaller experimental group.

Ivar Giaever (1973) dealt with more mundane matters, such as applying scientific discoveries to everyday needs. Early in his career he had realized that his more rigourous approach as a physicist could be of benefit in biology and medicine where pragmatism reigned supreme. As the search for abnormal cell division, possibly cancerous, in tissue cultures is usually performed in complete ignorance of Maxwell's equations, he developed an invention and set up a small high-technology enterprise to manufacture and market an instrument capable of unambiguous and objective measurements. Now he needs the skills of an economist! On a much larger scale Leo Esaki (1973) of tunnel-diode fame cited examples of how the results of pure research, an almost do-it-yourself application of quantum mechanics in semiconductors, can lead to the establishment of a vast high-tech industry. Long experience in academic and industrial environments enabled him to formulate a set of golden rules for success (see insert), rather anti-authoritarian and surprising when voiced by a Japanese, reputed paragons of obedience and conformity, but relished by the younger listeners.

In 1997 it will be 100 years since Alfred Nobel's fruitful testament was published, and when in 2000 the 50th Lindau reunion takes place a century of awards will come to a close that began with Roentgen, van't Hoff and von Behring. Perhaps someone in this summer's Lindau audience will by then already have the inspiration — Esaki Rules or no — that would eventually not only lead to a royal handshake in Stockholm, but also to an honoured return visit to Lindau.

Simon Newman, *Slough*

Leo Esaki's Rules for Success

- Don't miss the opportunity for the leap forward through being trapped by past experience or social conventions.
- Don't become too attached to the great authority in your field and risk losing sight of your own potential: the eminent professor may get the Prize, his subordinates never do.
- Discard information your don't need; just retain what is relevant and leave memory space free.
- Don't avoid confrontation to defend you own position: sometimes you may have to put yourself first.
- Don't lose your childhood spirit of curiosity, a vital component of imagination.